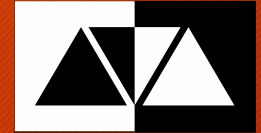


ACCELERATORS
VALIDATING
ANTIMATTER
PHYSICS

School Summary
29th June 2018, CERN



AVA Events



- International School on Antimatter Physics
- Topical Workshops on Diagnostics for Accelerators and Experiments 15-17 October @ CIVIDEC, Vienna
- More to come in 2019!
- Symposium on 28 June 2019 to present project to wider public; Conference in spring 2020.

Events are open to wider community!



AVA Brochure



ACCELERATORS VALIDATING ANTIMATTER PHYSICS

A Marie Skłodowska-Curie European Training Network

During the first moments of the Big Bang, both matter and antimatter should have been created in equal amounts. But the observable universe is mainly matter and there remains a fundamental question to be answered by physicists:

Where has all the antimatter gone?

ANTIMATTER PHYSICS

A challenge was provided in 2016 by the first observation of the decay of the antiproton into a positron and a neutron. The measurement was made by the ALICE experiment at the Large Hadron Collider (LHC) at CERN. This was the first time that an antiproton was observed to decay into a positron and a neutron. The observation was made by the ALICE experiment at the Large Hadron Collider (LHC) at CERN. This was the first time that an antiproton was observed to decay into a positron and a neutron.

THE FIRST EVER OBSERVED ANTIMATTER PARTICLE DECAY

ALICE has provided the first observation of the decay of the antiproton into a positron and a neutron. The measurement was made by the ALICE experiment at the Large Hadron Collider (LHC) at CERN. This was the first time that an antiproton was observed to decay into a positron and a neutron.

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The project is named after Ava to honour the life of an inspiring little girl who touched our hearts.

A Marie Skłodowska-Curie European Training Network

ACCELERATORS VALIDATING ANTIMATTER PHYSICS

The AVA (Accelerators Validating Antimatter Physics) project is an innovative Training Network that has received a Marie Skłodowska-Curie Action.

The project enables an interdisciplinary and cross-sector program on antimatter research and development. The network partners include most of the European expertise in antimatter research and joins their scientific, engineering and international research centres and partners from industry and government.

Within the AVA project, partners carry out research in various fields: beam optics, particle detectors, simulation, and data analysis. The project includes training and dissemination activities, as well as an international training programme consisting of schools, topical workshops and conferences that is open to all AVA partners, as well as the wider scientific community.

The AVA project is managed by a Supervisory Training Network, a cross-sector body that coordinates the project's activities and oversees the project management.

Recent early stage researchers have been recruited to advanced scientific teams. A structured combination of local and national-level training is offered within AVA. This includes hands-on training with state-of-the-art accelerator facilities, as well as an international training programme consisting of schools, topical workshops and

WORK PACKAGE

The improvements in simulations of beam storage, handling and control that are being developed in AVA's first work package need to be accompanied by R&D into enhanced Beam Diagnostics that can monitor the properties of a low energy antiproton beam and help verify simulation models experimentally. The research complements work on facility design and optimization and at the same time provides vital information about the beam for detailed studies in the rest remaining work package, antimatter experiments. R&D is carried out into beam profile, position and intensity measurement, as well as detector tests with the aim to provide significant improvements in detection resolution and sensitivity.

The exact measurement of the beam profile in an accelerator of great importance for the understanding of the physical processes happens in the shape of particle resonances in the detection of particles in the detector of the beam transport. This requires the detection of small quantities of light which is difficult because other parts of the beam emit much higher signal levels. A project in an accelerator (ALICE) of beam profile measurement aims to meet this measurement in specific regions of the beam. This is particularly important for the AVA project at the University of Liverpool. Current beam profile measurement adopts this insight method for advanced measurement that can't presently be achieved with any other technique. Working with ALICE, the measurements that are obtained through this method and generalised to other accelerators.

For the optimization of any detection techniques it is essential that detailed knowledge into the detector characteristics, gain, dynamic range, and timing, as well as the detector's response to the beam, is available. This is achieved through the use of a dedicated test facility at CERN's existing infrastructure and facilities. This facility is used to carry out investigations on the detector's response to the beam. The work package will use a wide range of beam diagnostic techniques, including simulation and technical design considerations such as timing resolution and vacuum requirements will help make the first design a validated

WITH A DETECTOR THRESHOLD BELOW 100. Such thresholds can be reached by a 500-keV based measurement of the beam's magnetic field, however the type of advanced monitor will require a specific instrument to provide a maximum dynamic range. Ultra-compact beam diagnostic measurements are not commercially available and are now being developed by David Harker at CERN in collaboration with other researchers within the work package.

BEAM DIAGNOSTICS

Diagnostics have been used for many applications in beam instrumentation. The use of CERN's ALICE detector as a beam position and profile monitor in the energy antiproton beam line, for example, has shown a new type of beam monitor which has been developed in collaboration with the ALICE team. The detector is a silicon strip detector with a silicon strip detector on the one hand and a silicon strip detector on the other. The detector has been already installed in the beam line in the range of 100 m, and is currently being tested in the range of 100 m, and is currently being tested in the range of 100 m.

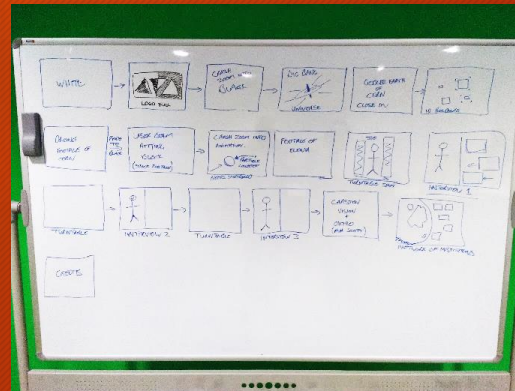
Antimatter detectors to be used in the AVA project will be required for beam energies below 100 keV. Diagnostics for beam instrumentation will be used to identify particle detectors, including Liquid Argon Detectors (LADs). These will trigger antiproton events and shall be used to monitor the beam line, to detect, or to identify, beam loss events. Beam loss events have already been tested for performance and are now being developed by David Harker at CERN in collaboration with other researchers within the work package.

AVA BEAM DIAGNOSTICS: R&D TESTS IN THE BOUNDARIES OF EXISTING TECHNOLOGIES.

The key experiments at the AD and FLAIR used for precision characterization of the antiproton regime, recent developments in beam diagnostics with an excellent stability and reproducibility. We follow a strategy of beam diagnostics, using state-of-the-art technologies. The R&D targets a novel detector system which will be able to operate in the range of 100 m, and will be able to operate in the range of 100 m, and will be able to operate in the range of 100 m.

ALICE PARTICLES AT CERN BEAM LINE MONITOR

Nature (anti)matters



Watch the video!



Project Web Site



URL: (http://www.)ava-project.eu

The screenshot shows the AVA project website homepage. At the top, there is a dark blue navigation bar with the University of Liverpool logo on the left, navigation links for 'Study with Liverpool', 'Our research', and 'About us' in the center, and a search bar and 'Sign In' link on the right. Below the navigation bar is an orange header with the text 'AVA'. The main content area features a large banner image of a particle detector structure. The banner text reads: 'Accelerators Validating Antimatter physics' in white, 'The goal of AVA is to enable further world-class research with low energy antiprotons' in orange, and 'FIND OUT MORE' in white. Below the banner are social media icons for Facebook, Twitter, and YouTube. On the left side of the page, there is a vertical menu with links: 'About us', 'Network Structure', 'Projects', 'Vacancies', 'News', 'Events', 'Dissemination', 'Press', 'Downloads', 'Links', 'Project T.E.A.M.', 'Contact', and 'Ava - the girl behind the name'. Below the banner, there are three columns of content: 'Welcome to AVA' with the AVA logo and European Union flag, 'Our Network' with a photo of a laboratory and text about research centers, and 'Upcoming Events' with a photo of a meeting and text about the 'International School on Low Energy Antimatter Physics'.

UNIVERSITY OF LIVERPOOL

Study with Liverpool / Our research / About us

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A-Z Sign In

AVA

AVA

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Ava - the girl behind the name

Accelerators Validating Antimatter physics

The goal of AVA is to enable further world-class research with low energy antiprotons

FIND OUT MORE

Facebook, Twitter, YouTube icons

Welcome to AVA

Accelerators Validating Antimatter physics (AVA) is the goal of this new network. This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721559.

Our Network

We work with the leading research centres, universities and industry partners.

[Find out more](#)

Upcoming Events

[International School on Low Energy Antimatter Physics](#)
25th - 29th June 2018, CERN, Switzerland - [Register now!](#)

QUASAR Group + CI



MIRROR Newsletter



- Main communication channel of AVA
- You will receive this by email in future!



Quarterly newsletter for the antimatter research community



Summary



- All presentations from this week will be available via indico page;
- Many more events to come, advanced level School, Topical Workshops, Conference & Symposium - stay tuned!
- There are many opportunities for getting involved.

Spread the word - participate - benefit